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Seaways

The International Journal of The Nautical Institute

Cybersecurity

Confronting the threat p9-11

The Nautical Institute

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Focus

Guarding against failure

> Cyber security is a relatively new catchphrase, at least in the maritime industry, but it is a subject that needs to be taken increasingly seriously

We have had a number of articles in recent years warning of the vulnerability of satellite positioning systems, be they GPS, Glonass, Galileo or the developing Chinese BeiDou. We keep raising this subject because navigators must be aware of these dangers and, more particularly, must be fully competent in navigating without the benefit of the ship's position being fed to them. To ensure they are not caught out by anomalies in the electronic systems they must use all available means for navigation and cross reference the positions obtained. At the risk of sounding old fashioned, that includes terrestrial navigation techniques around the coast and even celestial navigation when deep sea. That this is not an academic exercise is shown by the recent Glonass failure (see pp 14-16) which lasted for 11 hours and resulted in a 55km positional error off the UK coast. The General Lighthouse Authorities' (GLA) promotion of eLoran will go some way towards guarding against the loss of GNSS positioning and the Institute supports the need for such a backup electronic system, not least for its accurate time provision, but even that will not remove the need for the traditional navigation skills and the maintenance of situational awareness.

The vulnerability of GNSS is but one threat to today's electronic systems. Cyber security is a relatively new catchphrase, at least in the maritime industry, but it is a subject that needs to be taken increasingly seriously (see pp 9 -11). The threat from unintentional corruption of computer systems is ever present, as we all know from years of using PCs and laptops, but it is probably true to say that none of us are actually consistently attentive to simple security measures to guard against it. Even major banks have had corruption problems in recent years which have left their customers without access to their accounts - and in that business sector cyber crime is taken very seriously with protective measures under constant development and refinement. It would seem that the maritime industry is not as yet a major target for the hackers and intentional corrupters of systems. However, it is best to be prepared for the day when their attention does turn this way and ensure you have the defences in place. Whether your ECDIS is corrupted intentionally or by accident, do you have procedures in place to deal with the loss of it and are your people still confident to navigate without it?

One way of assessing whether they are is to include such an eventuality in a navigation audit process in your ship or fleet. There are various ways to carry out such audits and two articles this month discuss the need to ensure that they are not merely documentary, checklist exercises (see pp 5-6 and p 8). They should be carried out in a supportive, 'no blame' manner to improve the capabilities of your bridge team and the lessons learned should be shared throughout the fleet. They too are a means of guarding against failure if carried out effectively. To explore this issue we consulted both our Sea-Going Correspondence Group and our LinkedIn group to identify what is happening in practice and what may be recommended as best practice. Similarly, these groups have been consulted on the issue of cyber security and their input is used in the Institute's representations to the industry to help seek workable solutions.

Many of the LinkedIn subjects are introduced by members of the group and generate significant debate. A recent one concerned the proliferation of courses to be undertaken whilst officers are supposedly on leave. Whilst some of the courses are recognised as beneficial, others are deemed to be little better than a tick box exercise for management, and there was a plea to combine courses of a similar nature to save on time and expense. The big question remains 'Why are all these courses necessary?' Is STCW not providing the competencies that are required so that companies feel the need to give top up training? These and other questions are currently being considered in the Command Seminar series on Navigational Competence (see p 26) and the conclusions will be used in our submissions to the IMO when STCW is again reviewed. While we understand the need to enjoy your time on leave, we do hope that you will be willing to spare a day to attend a Command Seminar if there is one near you.

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Mariners' Alerting and Reporting Scheme

MARS Report No. 263 September 2014

MARS 201446

'Own goal' as tow collides with tug

Edited from official MAIB report 10-2014

➔ An unmanned, decommissioned fisheries protection vessel was under tow when it developed a list of about 10 degrees to port. The tug's Master informed the tug company's managers and then called the local coastguard authority to request permission to seek shelter in a nearby bay and investigate the cause of the list. In preparation for this, he reduced the scope of the tow from 480 metres to 200 metres and altered course towards the place of refuge. The Master was informed by the coastguard that he would need to take a pilot to enter the bay since he was not simply seeking shelter, but intending to board the towed vessel to investigate the list. The Master subsequently decided to anchor the tug and tow in the deep anchorage outside the bay where no pilot was required.

The weather at the deep anchorage was light winds, slight sea and good visibility. The tidal stream was north-easterly about 0.9kt. The Master's plan was to anchor the tug and then board the towed vessel himself to investigate the cause of the list. He reduced the length of the tow further, to 100 metres, and stopped the tug downtide of the tow. An officer was forward with a seaman and the Master and the chief engineer were on the bridge. The towed vessel was about 60 metres away when the Master ordered to let go the port anchor and put one shackle of chain in the water. At this point, control of the anchor windlass was transferred to the bridge and the cable was walked out. The anchoring had the effect of pivoting the tug to port, stopping it in the water, side-on to the tide and in the path of the tow, which maintained its momentum.

When 1½ shackles were in the water, the Master stopped walking out the anchor cable and used the searchlight to locate the towed vessel, which had been lost visually. A few seconds later, the towed vessel was seen closing the port side of the tug at right angles.

The Master immediately attempted evasive action to avoid a collision but the towed vessel struck the tow just aft of midships on the port side. As the Master attempted to manoeuvre clear he was informed that there was major water ingress to the engine room. The towed vessel's bow had penetrated the tug's shell plating below the waterline in way of the hydraulic motors in the engine room. The Master called the coastguard on VHF, advised them that the engine room was flooding and requested immediate assistance. Meanwhile, the hydraulic pump motors failed due to water ingress resulting in the immediate loss of all hydraulic power, which disabled the windlass. Concerned that the vessel might sink, the Master released the tow and put both engines full ahead in an attempt to dredge the anchor into shallower water.

Tug (left) and towed vessel (right)

Although the tug was later saved due to the actions of the Master and the quick response of local authorities, the towed vessel eventually sank.

The official investigation found the following:

- The Master's lack of appreciation of the dangers resulting from tidal effects on the tow when anchoring was a direct contributing factor.
- The Master contacted the company as soon as he became concerned about the list on the towed vessel. However, there were no instructions or guidance in the company's procedures regarding the use of senior, experienced staff from the management company to assist Masters in planning their response to crisis situations such as this. Had the Master developed a plan in conjunction with senior, experienced staff from the company, it is likely that the tidal conditions would have been taken into account.
- Had the Master taken a pilot, the subsequent anchoring would have been better prepared and therefore (probably) not have resulted in a collision.

MARS 201447

Sideways under the bridge

Edited from official report RS 2014:01e from the Swedish Accident Investigation Authority

➔ A small dry cargo carrier was en route in a vessel traffic services (VTS) controlled restricted waterway and, because of her size, was without a pilot. This was the first time the Master had navigated this section of the waterway. At 05:20 the vessel reported to VTS at a calling-in point at which time the VTS gave information on expected traffic. The Master started his watch at 06:00. At about noon, with both the Master and chief officer on the bridge, the vessel arrived at a bridge where extensive maintenance work was in progress on the fendering.

As the vessel approached the bridge, she was conned towards the port side of the channel to line up the passage under the bridge. The speed was about nine knots, despite a speed limit of five knots that should have been observed at this point. The Master stated that something appeared to happen to the steering and that they lost control over the vessel. At that point the engine was put to full astern and the vessel naturally veered to starboard (right hand propeller), colliding with the fendering. The speed of the vessel at the time of the

Normal approach to bridge (fendering can be seen on either side)

collision was just over four knots.

On both fenders alongside the bridge there were many people carrying out various repair work. They had seen the vessel and, from the unusual approach movements, realised that the vessel was about to collide with the repair site. While trying to avoid being hit by the vessel one person fell into the water, but managed to climb out of the water himself without being hurt. After the collision the vessel did not stop but continued on its journey.

The official report found, among other things, that:

- VTS did not provide the vessel with any information about the construction works when the vessel reported her position at the various reporting points along the way.
- The bridge repairs were reported in Swedish notices to mariners (in Swedish and English). However, the charts and publications carried by the vessel were British Admiralty, and the UK Hydrographic Office did not publish this particular information on the bridge repair works.
- The fact that the vessel personnel were unaware of the ongoing repair work on the bridge probably affected the Master's actions and contributed in part to the accident.

No anomalies were found with the steering system, so inadequate shiphandling was probably a factor. A substantial decrease in engine power was applied immediately before the turn to starboard in order to reduce speed. This in turn led to an impaired steering effect since the propeller wash had by then decreased or stopped altogether. This, in turn, could have been experienced as though there was something wrong with the steering.

■ **Editor's note:** Good ship handling is anticipation, not reaction. By arriving close to the bridge at too high a speed, the Master reduced his options and unwittingly set in motion a series of events that led to the heavy contact with the bridge fendering. Of course, as in many accidents, there are several contributing factors. In this case the facts that the Master was new to this part of the waterway and that he was unaware of the repair works and the required speed reduction were also contributory.

MARS 201448

A few steps too many

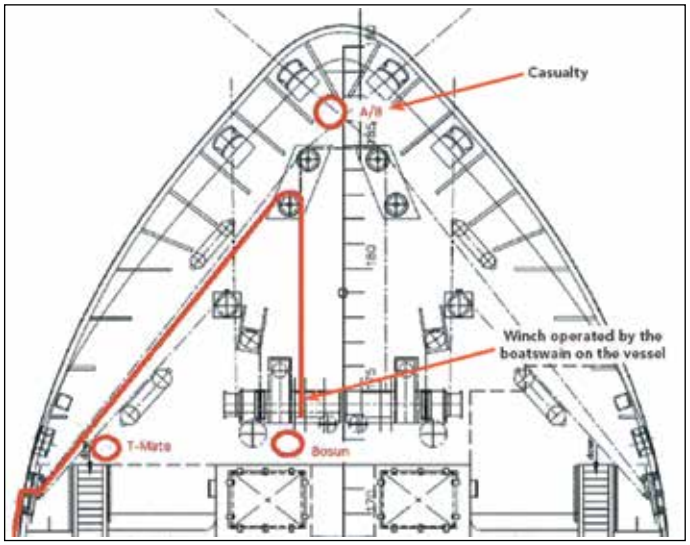
Edited from official report of the Dutch Safety Board, Sept 2012

➔ A small general cargo vessel was entering a lock and a spring line had been passed ashore. As the vessel's propulsion was going astern in order to stop the vessel the Master reported by VHF radio to the deck crew that the vessel was 'in position' – although the vessel was still advancing at about 0.7 knots. The winch brake was fully tightened and almost immediately, and without warning, the synthetic spring line broke.

At this same time, a seaman had walked forward a few steps to retrieve a heaving line that had been thrown back to the vessel from ashore. This caused him to enter the snap back zone for the spring just as it broke. The seaman was hit by the mooring line and was killed almost instantly.

The official investigation found among other things that:

- The crew may not have been aware of all of the risks involved for mooring operations.
- Some publications used for informing mariners of snap back zones underestimate the extent of these zones. Other publications, such as those by The Nautical Institute or Seahealth Denmark are more accurate.
- A recently published IMO document (2013), MSC 92/inf.11, also has clear guidance to help prevent accidents while mooring.



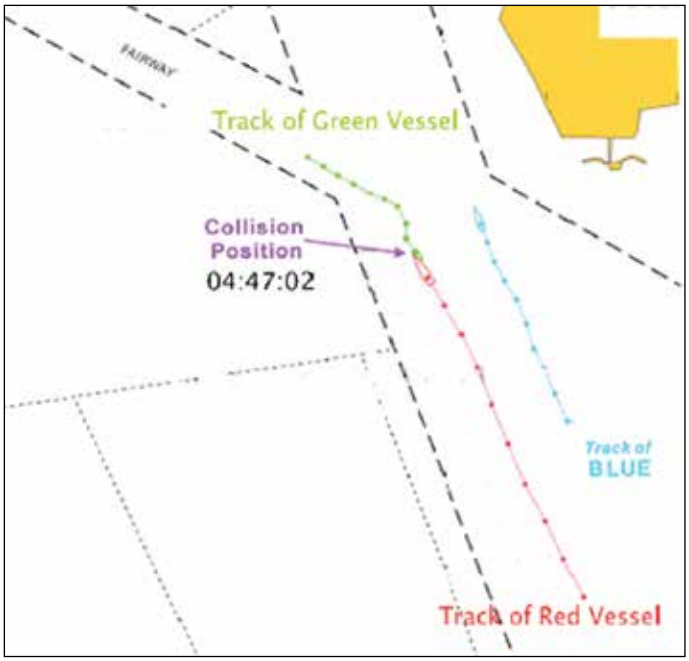
MARS 201449

No one obeys the rules - classic collision

Edited from official report (16 May 2013) by the Hong Kong SAR Marine Accident Investigation Section

➔ The weather was fine with light winds, a smooth sea and visibility of about 4nm. The red vessel [see image] was making way at about 12.5 knots. The pilot on the red vessel observed a radar target, the green vessel, on a radar bearing two points on the port bow at a range of 1.8 nm. The green vessel was also visually observed to be a crossing vessel that the pilot estimated would cross ahead at 0.5nm. He assessed that a close-quarters situation was developing due to the green crossing vessel and other traffic such as the blue vessel on their starboard bow. A continuous sound signal was given from the red vessel's whistle for about 30 seconds to attract the attention of the crossing vessel. For the time being the red vessel maintained her course (338°T) and speed.

A few minutes later, in order to allow more room for the green vessel and other traffic in the vicinity, the pilot ordered a speed reduction; first to slow ahead, then dead slow ahead and stop. A few minutes later the green vessel was observed to be crossing ahead at a range of four cables. To allow the green vessel to pass ahead even sooner the pilot ordered the helm ten degrees to port. While the vessel was swinging



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to port, the green vessel was observed to alter course to starboard. In an attempt to avoid collision, the pilot aboard the red vessel ordered the helm to midship and then hard-to-starboard while the engine was at dead slow ahead. At about this time the red ship sounded three prolonged blasts of the vessel's whistle. Shortly thereafter the bridge team members felt the vessel shudder; it was suspected that a collision had occurred with the green vessel.

Meanwhile, on the green vessel, the only person on the bridge responsible for steering the vessel and keeping a proper lookout was the OOW. As the green vessel was proceeding at a speed of about five knots, the red vessel was observed heading north in the fairway. The OOW initially assessed that there was sufficient room for his vessel to pass clear ahead of the red vessel. Within a few minutes he realised his assessment was wrong so he altered course to starboard attempting to give way and pass clear. At this juncture the red vessel was observed to be altering course to port heading towards his vessel. In order to avoid collision, the OOW then altered course to port. Despite these actions there was a collision with the red vessel.

Red vessel

Green vessel

Following the collision the green vessel's engine compartment was flooded and the vessel finally foundered some two hours later. Her six crew boarded the vessel's lifeboat and were rescued. The red vessel sustained paint scratches to the starboard bow.

The investigation revealed the following contributing factors:

- The green vessel, being the give-way vessel in a crossing situation, failed to comply with Rule 15 (Crossing situation) and Rule 16 (Action by give-way vessel) of the International Regulations for Preventing Collisions at Sea 1972 (COLREGS) for not taking early and substantial action to keep out of the way of the red vessel.
- The red vessel, being a stand-on vessel in a crossing situation, failed to comply with Rule 17 (Action by stand-on vessel) of the COLREGS but [reduced speed and] altered course to port to avoid collision with the green vessel.
- Instead of a continuous sound signal of 30 seconds, or even the three prolonged blasts just before the collision, the red vessel should have sounded at least five short and rapid blasts on the whistle when she failed to understand the intentions or actions of the green vessel.
- Weather and visibility, conditions of navigational equipment and main engines, alcohol, drug and fatigue issues were not found to be contributing factors to the accident.

■ **Editor's comment:** If you were OOW or Master on the red vessel, what would you have done, given the pilot's action to reduce speed and eventually come to port even though they were the stand-on vessel? Not an easy situation for anyone.

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Reports will be carefully edited to preserve confidentiality or will remain unpublished if this is not possible.

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